



REPLACED COMMON HEPATIC ARTERY PASSING ANTERIOR TO PANCREAS: A RARE AND CHALLENGING ANATOMICAL VARIANT DURING PANCREATICO DUODENECTOMY

Hepatobiliary Surgery

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ABSTRACT

Background: Safe Whipple's procedure needs proper knowledge about Anatomy to avoid injuries. Normal vascular anatomy (celiac and hepatic) can be found in only 50–70% of individuals. Good knowledge about aberrant vascular anatomy is required to avoid unnecessary complications.

Case presentation: An elderly man presented with history of obstructive jaundice due to Periapillary carcinoma with abnormal CHA and left hepatic artery morphology was discovered after MD CT (Pancreatic protocol). After ERCP Stenting for cholangitis we have proceeded for Whipple's procedure. **Conclusion:** Despite the anomalous origin and anterior course of replaced Common hepatic artery, Classical Whipple's with preservation of replaced Common hepatic artery and regional lymphadenectomy with no major intra and post-operative problems was conducted by superior mesenteric artery first approach. Prior to major hepato-pancreaticobiliary surgery, a thorough examination of a contrast enhanced computerized tomography scan is required to understand vascular anatomy, recognize anomalous vessels, and understand their significance. Nevertheless, if the abnormal vessel anatomy like replaced Common hepatic artery are identified during surgery, a careful dissection of the anomalous vessel is essential to identify all vascular relationships and avoid irreversible injury.

KEYWORDS

BACKGROUND:

The Surgical procedure of choice for the management of Periapillary malignancies (head of the pancreas, distal common bile duct, ampulla of Vater and second part of the duodenum), extremely selective cases of chronic pancreatitis, and severe trauma to the pancreatic head and duodenum is pancreaticoduodenectomy (PD) [1, 2]. It is highly challenging operation for surgeons. Vascular anomalies are a rule rather than exception during this surgery. The coeliac trunk takes origin anteriorly from the abdominal aorta at the twelfth thoracic vertebrae. Then it goes anteriorly or somewhat anterolaterally in the lesser sac. Then split into three branches near the pancreas upper border: the splenic artery (SA), the left gastric artery (LGA), and the common hepatic artery (CHA) [3]. Normal anatomy present in 55–79% patients, other patients will have aberrant or anomalous vascular anomaly. These anomalies may contribute to the surgical difficulties during Pancreaticoduodenectomy [4–6]. Some vascular anomalies may also interfere with resection and reconstruction of the digestive tract during PD. Others (e.g., replaced left hepatic artery (RLHA), accessory left hepatic artery (AHA)) may not [7, 8]. Michel's described Hepatic artery and its anomalies were based on anatomy of 200 cadaver livers. Later Hiatt et al. [9] simplified Michel classification. He proposed classification scheme with 6 arterial variants. Based on literature, two distinct RCHA/RRHA pathways arising from SMA may be identified. 2 different pathways are:

(1) The extra-parenchymal route (outside the pancreas head)-RCHA/RRHA arises from SMA and passes posterior to the pancreatic head and then to liver. In this case, the dissection of artery and separating it from pancreatic head can be done without difficulty if course has been identified pre-operatively.

(2) the intra parenchymal route (within the pancreatic head)-RCHA/RRHA arises from the superior mesenteric artery and travels through the pancreatic head parenchyma then to the liver hilum;

It is difficult to preserve the intra parenchymal component of the RCHA/RRHA in this situation (when saving of RCHA/RRHA is impossible it is necessary to divide and reconstruct the vessel by anastomosing to gastroduodenal artery (GDA)/Aorta/LGA) [10].

Failing to recognize such vascular abnormalities before surgery may raise the risk of iatrogenic vascular damage. The presence of above anatomical variations may increase the risk of complications through direct (bleeding due to iatrogenic intraoperative vessel injury) or indirect (postoperative ischemia of tissues and anastomotic leakage)

mechanisms. Pre-operative MDCT scans are useful in guiding the surgeon through-out the PD surgery and reducing the risk of intra/post-operative complications [11]. In this paper, we present a very rare case of replaced Common hepatic artery arising from the superior mesenteric artery coursing anterior to pancreatic head associated with Accessory left hepatic artery originating from the left gastric artery.

Case presentation:

A 68-year-old gentleman with no comorbidities was admitted to our hospital with complaints of painless progressive jaundice, loss of weight and loss of appetite. Laboratory tests revealed elevation of bilirubin (26mg/dl) and Normal CEA (1.5 ng/mL) and CA 19-9 (26 U/mL). Triphasic CECT whole abdomen was done. Axial 0.5 mm thin section CT scans were performed through the abdomen with intravenous non-ionic contrast of 100 ml and negative oral contrast (water). A plain scan was followed by an arterial, portal (35 s post injection) and late venous phase (70 s post injection) scans. After a study of the axial section, thorough reconstructions were performed in the 3D volume rendered, multiplanar and curved planes and then studied. On CT scan he was found to have periapillary tumour of size 1.5 cm with anomalous vascular anatomy. It also showed RCHA arising from SMA and ALHA arising from LGA. This RCHA originated from SMA anteriorly just below neck of pancreas travelled anterior to pancreatic head then coursing cranially between first part of duodenum and Common bile duct (CBD), then it travelled along anterior wall of CBD to reach the hilum (Figs. 1, 2, 3). The tumour was deemed resectable by the multidisciplinary board in the absence of vascular involvement and distant metastases, and the patient was scheduled for surgery. As patient developed cholangitis, we subjected him for pre op ERCP Stenting. We had done surgery after 6 weeks. After Kocher's manoeuvre, a palpable mass 2×2 cm in the periapillary region was discovered intraoperatively, and suspected hepatic artery abnormalities were verified. This anomalous common hepatic artery originated from SMA just below neck of pancreas traversed anterior to pancreatic head giving rise to inferior pancreaticoduodenal artery, then coursing on superior border of pancreas between first part of duodenum and CBD and then continued anterior to CBD. Divided in to right and left hepatic artery (Figs. 4, 5, 6). Using Care full dissection, we successfully dissected RCHA away from pancreatic head, looped and spared it. The RCHA was completely dissected along its course and There is no separate GDA to ligate. RCHA was dissected along its course up to hilum separating it from CBD and preserving it. Simultaneously, we detected an Accessory

LHA arising from the LGA. After securing and confirming RCHA pancreatic neck transection was done. Classical pancreaticoduodenectomy with lymphadenectomy was performed. Patient had transient elevation of liver enzymes post operatively . which was managed conservatively. Patient was discharged from the hospital on postoperative day15. Pathologic examination of the operative specimen showed a well differentiated periampullary adenocarcinoma of stage T2N1M0 with negative margin (R0).

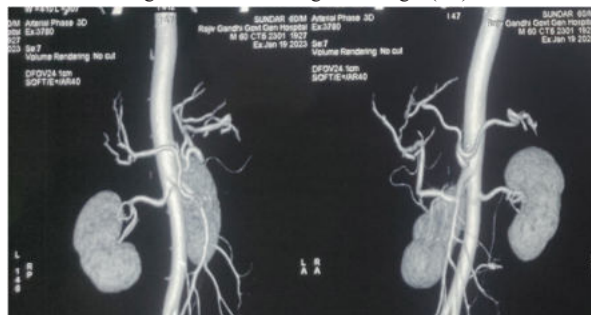


Figure 1: CT Angio abdomen showing RCHA and ALHA.



Figure 2: Intra op picture showing Replaced Common Hepatic Artery (RCHA) running anterior to pancreas before Pancreas transection.



Figure 3: Intra op picture showing Replaced Common Hepatic Artery (RCHA) running anterior to pancreas after Pancreas transection.

DISCUSSION:

Pancreaticoduodenectomy is the standard curative surgery for periampullary malignancy globally [12]. In spite of the technical advancements, Whipple surgery remains a complex operation with significant morbidity and mortality rates even at experienced centres [13]. This complexity even more difficult, with vascular anatomy variation. Michel's [6] classified hepatic arterial anomalies into 10 types. Hiatt et al modified classification [9]. In 0.4% to 4.5% of patients, the Common hepatic artery (CHA) can be replaced (taking a path other than the normal course) [3,14,15]. Complicated embryological development is to blame for this abnormal vascular structure.

We here report a rare case of combination of RCHA originating from SMA passing anterior to head of pancreas and Accessory LHA from LGA. RCHA after originating from SMA passes anterior to pancreas head and then anterior to CBD (Figs. 7 and 8). This course of anterior passage of RCHA is very rare. There are many anatomical variants (1.4–3%) that are not described using Michel's and Hiatt's

classifications [16]. Using CT scan and DSA, Song et al. [3] presented the biggest number of celiac and hepatic artery variations in 5002 individuals. They described supra pancreatic infra pancreatic, trans-pancreatic, pre superior mesenteric vein, and retro superior mesenteric vein, courses of CHA/RRHA [3]. [10]. However, none of these anomalies not described as our case. The importance of this artery is possibility of mistaking it for GDA, which comes from CHA, and ligating it while doing dissection which causes a reduction in blood flow to the liver and biliary tract. At this step, a clamp test and proper dissection CHA From Celiac trunk would at the very least alert us to a problem. Furthermore, because this artery starts from the SMA near the pancreas neck and travels anteriorly, it might be damaged during neck transection or uncinete dissection. Because of this SMA first, with careful dissection of the artery from the pancreatic head is ideal to tackle vascular anomalies. As hepatic artery primarily supplies the biliary system, maintaining arterial circulation to the liver during Whipple's is critical. Damage to hepatic trunk can lead to bile leaks or bilioma. These can cause significant morbidity in the post-operative period. If arterial variations were discovered during the surgery, rather than pre op, it could impact the outcome of Whipple and raise the rate of surgical complications such as pancreatic fistula, haemorrhage, hepatic ischemia or failure, and bile leakage [17]. By knowing vascular anomalies before surgery we can avoid vascular injury and major morbidity and mortality.

Angiogram can provide important details about Vascular anomalies, but it does not provide details about relationship between the course of the arteries and the pancreatic parenchyma, which is important thing during presurgical planning. Hence MD CT with angiography becomes necessary Before surgery[11]. In major hepatobiliary and pancreatic surgery, various strategies have been described to manage an aberrant CHA: (1) Ligation versus preservation/reconstruction depending on whether the aberrant CHA is accessory or replaced, as well as depending on course of the artery in relation to pancreatic head and depending on whether the tumour infiltrates the vessel; (2) preoperative embolization; (3) temporary clamping and confirmation collateral circulation before ligation if discovered intraoperatively; and (4) neoadjuvant chemotherapy and reassessment [15, 18]. In situations of early detection and proper therapy, an aberrant CHA appears to have no significant influence on the post-operative course and oncological results following PD [19]. To minimize needless problems during and after PD surgery, a multidetector CT scan with reconstruction important part of preoperative evaluation and any aberrant vessels and there course should be noted and surgery planning should be done accordingly. Following that, the surgical strategy and intraoperative procedure are determined by the vascular anatomical differences. If hepatic artery abnormalities are discovered during surgery, intraoperative treatment options include, dissection, and traction away from the resection site, division, and anastomosis [15].

CONCLUSION

RCHA is rare anomaly. RCHA with anterior course is rare. So Careful examination of MDCT is essential before the major hepatopancreato biliary surgery, to identify vascular anatomy, anomalous vessels course, and understand their Importance to avoid unintended adverse effects. If Vascular anomaly present we can plan surgery accordingly. Careful preoperative MDCT scan examination and meticulous surgical technique, are needed for preserving an aberrant hepatic artery and avoiding morbidity post operatively.

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